

XXII. *On the Diaposematic Resemblance between Huphina corva and Ixias baliensis.* By F. A. DIXEY, M.A., M.D., F.L.S., Fellow of Wadham College, Oxford.

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PLATE XXXI.

AMONG the geographical forms of *Huphina nerissa*, Fabr., there occurs in Java, Bali and Lombok a fairly well-marked island race to which Wallace in 1867 gave the name of *corva*. A similar form, called by Butler from its habitat *H. sumatrana*, seems almost indistinguishable from Wallace's type.

The object of the present paper is to call attention to the remarkable similarity that exists between both sexes, but especially the female, of *Huphina corva*, and certain females of a form of *Ixias* found in the same locality. The *Ixias* in question belongs to the group containing *I. venilia*, Godt., and *I. reinwardtii*, Voll., being indeed scarcely separable from the latter. It is the local race inhabiting the island of Bali, and has accordingly received the name *baliensis* from Fruhstorfer.

The resemblance here spoken of is well seen on Plate XXXI, but is still more striking when the actual specimens are examined. It can, I think, scarcely be doubted that the likeness between these forms of such diverse affinities has a mimetic significance. The specimens represented in Fig. 3-7 were all captured on the same occasion by Mr. R. Shelford, M.A., F.E.S., and were kindly given by him to the Hope Department at Oxford. It does not appear to have been noticed that the series contained an *Ixias* until the insects were on the point of being incorporated with the general collection.

It will be observed that the resemblance to *Ixias baliensis*, though shared by both sexes, is stronger in the female than in the male *Huphina*. This is in accordance with the well-known rule as to the superior means of protection employed by the female sex in correspondence with its

greater needs—a rule which holds good not only in mimicry but also in other kinds of defence. Another point worthy of notice is, that as shown by Figs. 6 and 7, compared with 6A and 7A, the resemblance borne to each other by the upper surfaces of the two insects does not extend to the lower. This seems to favour the view that the enemies in this instance guarded against are such as attack butterflies on the wing rather than at rest.

But the most interesting feature in the case is the evidence it affords of diaposematism, or the interchange of warning characters between mimic and model. In his original description of *H. corva*, Wallace drew attention to the fact that this form possesses a black border to the hind-wing, "much wider and more defined than in the allied forms" (Trans. Ent. Soc. Lond., 3rd Series, IV, 1867, p. 339). This dark border, as can be seen in Plate XXXI, figs. 3–6, is present in both sexes; it is formed in the female by the fusion of the submarginal row of V-shaped spots seen in Fig. 1 with the actual dark edging of the wing. A somewhat similar feature, though less pronounced, occurs in *H. lichenosa*, Moore, from the Andaman Islands; but in the ordinary allied forms known as *Huphina nerissa*, *H. phryne*, *H. copia*, etc., it does not exist. A comparison of Figs. 1 and 2, which represent the female and male respectively of the typical *H. phryne* of continental India, with the figures of *H. corva* in the same Plate, will show the difference referred to by Wallace. This difference is even better marked in the dry-season form of *H. phryne* than in the wet, the latter being the phase here figured.

Now it is in large measure to the presence of this dark border on the hind-wing that *H. corva* owes its correspondence in aspect with *I. baliensis*. It is of course open to anyone to assert that the dark border is merely an accidental feature in *H. corva* without any special significance. But when we consider that this feature is practically restricted to that form of the *H. nerissa* group whose range overlaps that of the *Ixias* which it so closely resembles, the conclusion seems at once to suggest itself that the presence of the dark border in *H. corva* is the result of a mimetic approach to the other insect. In this respect, then, the *Huphina* has acted as the mimic and the *Ixias* as the model. If, however, we turn to the forewing, we find the process reversed; here it is the *Ixias*

that has departed from the usual aspect of its nearest relatives, becoming in this case the mimic, while the *Huphina* stands as the model. The resemblance has therefore been attained by a process of give-and-take on both sides; nor would it be easy to find a better illustration of the principle of reciprocal change or diaposematism.

It is fair to note that specimens of *H. corva* from Java and the representative form *H. sumatrana* from Sumatra also possess the dark border to the hind-wing, and are not known to be in mimetic association with any *Ixias* found in those islands. It is perhaps unlikely, though not impossible, that a corresponding *Ixias* may yet be observed to inhabit these localities; but in view of well-ascertained facts as regards the shifting of areas of distribution among butterflies it would not be extravagant to suppose that the *Huphina* has somewhat extended, or the *Ixias* has contracted its range since the resemblance was first set up. In any case, we have the fact that the specimens shown in Figs. 3-7 were all caught by the same person in the same place and on the same day. *H. corva* occurs also in Lombok, where its relation with *Ixias reinwardtii*, Voll. ♀ is no doubt the same as with *I. baliensis* in the neighbouring island.

It is to be observed that not all female specimens of *H. corva* show the mimetic approach to *Ixias* in the same degree. The hind-wings are sometimes rather conspicuously veined, as often in the wet-season phase of *H. phryne*; moreover the dark *Ixias*-like border is less distinct in some specimens than in others. So too, *I. baliensis* ♀ may possess a pale orange suffusion in the central area of the fore-wing. These features, which may possibly be dependent on season, certainly tend when present to impair or abolish the excellence of the mimetic picture.

Mr. Finn, in the "Journal of the Asiatic Society of Bengal," 1895, pp. 621, 624, 626, 635, etc., has produced some direct evidence that *Huphina phryne* is disliked by insectivorous birds (*Liothrix* and *Chloropsis*). There is not, so far as I am aware, any such evidence in the case of *Ixias*. But if the foregoing conclusions are well-founded, it will follow that the association between the two forms here discussed must be synposematic and not pseudosematic, Müllertian and not Batesian.

EXPLANATION OF PLATE XXXI.

FIG. 1. *Huphina phryne*, Fabr. ♀.

2. *Huphina phryne*, Fabr. ♂.

These figures (1 and 2) represent the ordinary form from continental India.

3. *Huphina corva*, Wallace ♂.

4. *Huphina corva*, Wallace ♂.

5. *Huphina corva*, Wallace ♂.

6. *Huphina corva*, Wallace ♀.

6A. *Huphina corva*, Wallace ♀ underside.

7. *Ixias baliensis*, Fruhst. ♀.

7A. *Ixias baliensis*, Fruhst. ♀ underside.

The above butterflies (3-7) were all taken by Mr. R. Shelford at Buliling, Bali, on May 19, 1905. The resemblance between *H. corva* ♀ and *I. baliensis* ♀ does not extend to the lower surface, as will be seen on comparing 6, 7 with 6A, 7A. In the dark border of the hind-wing, *H. corva* (3-6) is seen to depart from the aspect of the closely allied *H. phryne* (1, 2) and approach that of *I. baliensis* (7).